

Food Packaging Technology Handbook (4th Revised Edition)

Author: NIIR Board of Consultants Engineers

Format: paperback

Code: NI93

Pages: 480

Price: Rs 1995 | US\$ 200

Publisher: NIIR PROJECT CONSULTANCY SERVICES

Shipping: 5 days

About the Book

Food Packaging Technology Handbook (3rd Revised Edition)

(Biodegradable Films, Materials , Polymers, Aseptic Packaging, Labels and Labelling, Packaging of Cashew Nuts, Dairy Products, Milk, Fish, Meat, Shrimps, Canning of Vegetables, Fruits with details of Machinery and Equipments)

Food packaging technology is primarily concerned with packaging activities regarding protection of food products from biological, physical or chemical agents. With the growth of modern civilization, people are getting more concerned with hygiene and quality of the food.

The packaging industry's growth has led to greater specialization and sophistication from the point of view of health and environment friendliness of packing material. The demand on the packaging industry is challenging, given the increasing environmental awareness among communities. The food packaging industry is growing at the rate of 22 to 25 per cent per annum. In near future it is going to be a booming industry.

Packaging has played a critical role as a differentiator in promoting brands, especially for packaged food products. With the increase in urbanization and emergence of supermarkets and hypermarkets, differentiating food products through the aesthetic appeal of packaging has become important for food manufacturers. Furthermore, consumers are increasingly paying more attention to the ingredients and contents of the package. This provides an opportunity for the food packaging technology & equipment manufacturers as food manufacturers need to differentiate their products by conveying the benefits of packaging technology on the labels and packets, such as shelf life, the time required for preparing the food, and nutritional contents to the consumers.

Biodegradable packaging is produced using biopolymers, which are molecules often found in living organisms, like cellulose and proteins. This means they can be safely consumed, degrade quickly, and often be created from waste plant products. The main applications of bio-based and biodegradable plastics are currently in (food) packaging, food service ware, (shopping) bags, fibres/nonwovens and agricultural applications. Bio-based drop-in plastics such as bio-PE and bio-PET are identical to fossil-based counterparts and can be used in exactly the same applications.

The more recently developed bio-based plastics (bio-PE and bio-PET) are also mainly used in food packaging. The increasing awareness of the environmental impact of packaging products and a willingness to replace packaging materials by alternatives with e.g. a lower carbon footprint or made from renewable resources are the main driver for development and the use of these materials.

This book gives comprehensive account of food packaging, which is the most important part to preserve the food for a long time. The present volume has been written primarily for the benefit of new entrepreneurs, technologists, technical libraries and for those who want to diversify in the field of food industry.

Contents

CONTENTS

1. Introduction

Containment

Protection/Preservation

Communication

Utility

Packaging Systems

Primary Packaging

Secondary Packaging

Tertiary Package

Unit Load

Consumer/Industrial Packaging

Biodegradable Packaging

Development of Bioplastic

Biopolymers

Starch Based Plastics (Biodegradable)

Bio-based and Biodegradable Plastics from
Genetically Modified Organisms

2. Biodegradable films for Food Packaging and Application of Nanotechnology in

Biodegradable Food Packaging

Biodegradable Polymer Films for Food Packaging

Biodegradable Polymers from Biomass Products

Starch

Cellulose

Other Materials

Pectin

Chitin and Chitosan

Proteins

Advantage and Limitations of Biodegradable

Polymer

Nanotechnology in Biodegradable Polymer

3. Biodegradable Materials for Food Packaging

Applications

Materials

Aliphatic Polyesters

Manufacturing Process

Manufacturing Filament Yarn

Polymerization

Drying

Melt Spinning

Drawing the Fiber

Winding

Manufacturing Staple Fiber

Drawing Tow

Crimping
Setting
Cutting
Polylactide Aliphatic Copolymer (CPLA)
Polycaprolactone (PCL)
Synthesis and Physicochemical Properties of
PCL
Poly (Lactic Acid) (PLA)
PLA Processing
Extrusion
Injection Molding
Injection Stretch Blow Molding
Cast Film and Sheet
Thermoforming
Polyurethane Foams
Processing Technology
Fillers for Bio based Packaging Materials
Cellulose Fiber
Wood Fiber
Technical Requirements
Types of Degradable Plastic
Oxo-Biodegradable Plastic
Fossil Resources
Hydro-Biodegradable Plastics

4. Biodegradable Polymers in Food Packaging
Polymers
Biopolymers
Origin and Description of Biobased Polymers
Starch
Production Process
Polylactic Acid
Poly (hydroxyalkanoates) (PHAs)
PHAs Production
Polycaprolactone (PCL)
Cellulose and Derivatives

5. Packaging Materials for Processed Foods
Metal Cans
Materials Used in Can Manufacture
The Steel Base
Thickness of Steel Base
Mechanical Properties
Basic Types of Metal Plate
Surface Finish
The Tin Coating
Marking of Differentially-Coated Plate
K Grade Tinplate
Grading of Tinplate
General
Tin-Free-Steel (TFS) Sheets

Tinplate and Its Application
Aluminium Cans
Manufacture of Three-piece Cans
Side Seam Welding
Types of Side Seam Welders
Other Types of Side Seams
Can Ends
Manufacture of Ends
Flanging, Beading and Double Seaming
Lacquers and Their Application
Plastic Lamination
The Future for Can Coatings
Discolouration in Lacquered Cans
Lacquer Performance
The Cans
The Two-Piece Can
DRD Cans
D&I or DWI Cans
Container Innovations
Corrosion of Tinplate
Corrosion in Lacquered Cans
Permissible Limits of Tin
Limits for Lead
Can Sizes
Inspection and Tear-down Examination of
Double Seam
On the Seam
After Tear Down
Critical Parameters
Optical Measurements
Performance Testing
Selection of Tin Coating Depending on the
Corrosivity of Packs
Specifications for the Metal Cans
Glass Containers
Composition of Glass
Improvements in Glass Manufacture
Hot and Cold End Treatment of Surface
Coating
Lightweight Containers
Glass Container Characteristics
Basic Parts of a Glass Container
Glass Neck Ring Finish
Closures for Glass Containers
Parts of Glass Closures
Vacuum Closures for Glass Containers
(i) Pry-off (side-seal) Cap
(ii) Lug-type or Twist Cap (Non-Baby Food Type)
(iii) Lug Type Caps for Baby Foods
(iv) PT (Press-on, twist-off cap)
Sealing of Glass Containers

Crown Corks
Procedure for Determining Capper Efficiency
Evaluation of Glass Container Closures
Pry-off (side seal) Type Caps
Lug Type Caps
Vacuum Measurements
PT (Press-on, twist-off) Cap
Cocked-up Cap and Dud Detections
Sampling Plan and Inspection
Tamper-Evidence of Processed Containers
Plastic Packaging Material
General Properties
Polyethylene (PE)
Polypropylene (PP)
Polyethylene Terephthalate (Polyester) (PET)
Polyamide (PA) or Nylon
Polyvinylchloride (PVC)
Polyvinylidene Chloride (PVDC)
Polystyrene (PS)
Polycarbonate
Ethylvinylalcohol (EVOH)
Polyvinyl Alcohol (PVA)
Regenerated Cellulose (Cellophane)
Cellulose Acetate (CA)
Paper, Paperboard and Foil
Pack Requirements
Water Vapour Transmission (WVTR) of Plastics
Oxygen Absorption
Fabrication of Flexible and Rigid Plastic Packages
Container Fabrication
PP/Foil/PP Laminated Tray
Co-extrusion
Closures for Hot-Fill or Retortable Plastic Containers
Cartons for Liquids
Packaging Requirements for Distribution
Off-flavours in Packed Food
Can and Can Coatings
Plastic Packaging
Economic Considerations

6. Packaging Trend of Carbonated and "Still"
Beverages
Introduction
Carbonated Beverages
Basic Manufacturing/Packaging Technology
Glass Bottles
Plastic Bottles
Bottling System
Bottle Filling

Bottle Crowning or Bottle Capping
Aluminium Cans
Non-Carbonated Beverages / "Still" Drinks
Aseptic Packaging System (Tetrapak)
Plastic Bottles
Plastic Closures
Purpose of Hot Filling
Flexible Pouches
Retortable Pouches
Bag-In-Box System
(a) Bags
(b) Containers
(c) Fillers

7. Aseptic Packaging of Foodstuffs

Introduction
The Product and Performance Range
The Functionality of Steam Aseptic Machines
Sterilization of Packaging Material
Forming the Cups
Positioning Stations
Sterile Zone
The Machine Technology
Drive and Control Engineering
Dosing Techniques
Labelling
Guidelines on Aseptic Packaging
Aseptic Packaging and Low-Germ Packaging
Aseptic Packaging
Low-Germ and Recontamination - Free
Packaging

8. Modified Atmosphere Packaging

Gases Used in Map
Techniques of Map
Gas Flushing
Compensated Vacuum
Different Modified Atmospheres
High Oxygen Atmosphere Packaging
Low Oxygen Atmosphere Packaging
Vacuum Packaging
Active Packaging or Functional Packaging or
Interactive Packaging
Packaging Materials

9. Labels and Labelling

Definition
Purpose of Labels
Identification

Information
Decoration
Types of Labels
Plain Paper Labels
Pre-gummed Paper Labels
Thermoplastic Paper Labels
Pressure-sensitive Paper Labels
Plain Paper Labels
Pre-gummed Paper Labels
Thermoplastic Labels
Pressure Sensitive Labels or Self-Adhesive Labels
Swing Labels — Tie on Tags
Printing of Labels
Alternative Markings
Surface Treatment
Materials Used for Labels
Papers
Foil and Laminates
Plastics
Adhesives
Labelling Machinery
Regulations
Labels for Freight Containers
Information
Position
Language
Pictorial Markings for Handling Instruction
IS
Recent Trends

10. Packaging of Milk
Packaging of Milk and Milk Products
Liquid Milk
Concentrated Milks
Milk Powder
Ice Creams
Butter
Ghee
Cheese
Indigenous Milk Products

11. Trends for Cheese and Other Dairy Products
Packaging
Milk Powder-Bulk
Milk Powder-Retail
Butter
Yogurt
Ice-Cream
Cheese
Cheese - Retail

12. Packaging of Malted Milk Foods

Introduction

Present Packaging System

Glass Containers

Variant

Advantages

Disadvantages

Modality of Usage

Pet Containers

Variant

Advantages

Disadvantages

Modality of Usage

Flexible Packaging Materials

Process of Packaging (Schematic)

Variant

Browns (Malted milk food)

Whites (Malted milk food)

Nutritional Health Beverage

Advantages

Disadvantages

Modality of Usage

Significance of Packaging on FFS

Functional Requirement

13. Packaging of Cashew Nuts

Introduction

Packaging System

(a) Specification of Tinplate Containers

(b) Specification for CFB Box

Recent Developments

Alternate Packaging Systems

(a) Bag - in - Box (Flexible) System

(b) Bag - in - Box (Semirigid System)

Consumer Packs

14. Lined Cartons for Packaging of Food

Products

Concept of Lined Carton Packaging System

Manufacture of Lined Cartons

Sequence of Operation

Printing

Varnish/lamination

Punching

Folding & Lining

Carton Filling & Sealing Machines

Sequence of Operation

Vacuum & Gas Flushing

Constituents of the Lined Carton

Tests

Liners

Criteria for the Selection of Liners

1. The Product to be packed which includes

2. Performance properties include

3. Marketing Demands include

Versatility of Lined Cartons

Product: Package Compatibility

Future Prospects of the Lined Carton Packaging

System

15. Canning of Vegetables and Animal Products

Asparagus

White Variety

Beans

Green (french waxed)

Broad Bean, Field Bean, Pigeon Pea (green) and

Cluster Bean

Cabbage

Carrots

Cauliflower

Corn

Whole-Grain Corn

Cream Style Corn

Creamogenised Corn

Vaccum-Packed Whole-Kernel Corn without

Brine

Cultivation and Maturity

Husking

Silking

Grading

Whole-grain Corn

Filling

Cream-style Corn

Handling of A10 Cans of Cream-style Corn

Corn-on-the-Cob

Drumsticks

Gourds (Cucurbits)

Mushroom

Okra

Peas

Potato

Spinach

Tomato

Crushed Tomato

Canning of Acidified Vegetables

A. Lowering the pH Using Acid

B. Lowering the pH by Fermentation

Fermentation Procedure

Microbial Changes during Fermentation

pH Considerations in the Thermal Processing of

Acidified Vegetables

Canning of Fermented Vegetables

Sterilisation Requirements

Process Schedule for Vegetables Packed in Glass

Containers

Thermal Process Schedule for Marine and

Animal Products

Process Schedule for Soups

16. Canning of Fruit Products

pH Considerations in the Canning of Fruits

Strength of Covering Syrup

Pink Discolouration in Canned Fruits

Apricot

Cherries

Guava

Grapes

Mango

Muskmelon (*Cucutnis melo*)

Mandarin Orange (*Citrus reticulata*, Blanco)

Segments

Papaya (*Carica papaya*)

Peaches

Pears

Pineapple

Process Schedule

Crushed Pineapple

Plums

Canned Dried Prunes

Strawberries

Fruit Cocktail

Strained Baby Foods

Fruit Juices, Beverages, Pulps and Concentrates

Tomato Juice

17. Packaging of Fish in Modified Atmospheres

Introduction

Modified Atmosphere Packaging

Application to Fish

Norwegian Practice

Disadvantages

Conclusion

18. Packaging of Fresh Meat

Product Characteristics

Packaging Principles

Packaging Materials & Techniques

19. Packaging of Shrimps

Introduction

Product Forms

Processing and Packaging

(a) Glazing

(b) Code Slip
(c) Inner Wrap
(d) Primary Carton
(e) Master Carton
(f) Closure and Reinforcement
Marking
Storage and Transportation
Quality Control and Inspection System
New Trends
Packaging Requirements for IQF Shrimps
Consumer Packs for IQF Shrimps
1. Deep Drawn Plastic Pouches
2. Printed Preformed Pouches
Flexible Vacuum Packed Pouches in Paper
Board Cartons
Labelling and Marketing for IQF Shrimps

20. Equipment Commonly used for Food
Processing and Preservation
Design Considerations
Indian Scenario
Special Development Needs
High Speed Specialised Centrifugal Separators
Large Capacity Spray-drying and Roller-drying
Plants
Evaporation and Aroma Recovery Plants
Specialised Energy Efficient Heat Exchangers
Aseptic Processing and Packaging Equipment
Special Types of Forming and Cooking
Machinery
Latest Types of Freezing and Freeze Drying
Equipment
System Designs
R & D Efforts
Food Machinery Listing
Equipments commonly used in Food
Preservation
Food Dehydration
(a) Sun Dryer
Solar Dryer
(b) Cabinet or Tray Dryer
(c) Tunnel Dryer
(d) Conveyor Dryer (Conveyor band dryer/belt
dryer)
(e) Spray dryer
(f) Freeze Dryer
(g) Drum Dryer
(h) Fluidized Bed Dryer
(i) Spouted Bed Dryer
(j) Flash Dryer
(k) Microwave Dryer

Food Irradiation

Food Irradiation Technology

(a) Ionizing Radiations

(b) Sources of Radiations

(c) Process Control

Food Freezing and Refrigeration

(a) Refrigeration Systems in Cold and Freezer Storage

(b) Compression Refrigeration System

Ammonia Systems

Food Canning

Metal or Tin Cans

Glass Cans

21 Active Packaging

Active Packaging Technologies

Antimicrobial Packaging

Ethylene Scavengers

Oxygen Scavenging

Carbon Dioxide Scavenging or Release

Humidity Buffering Films and Liquid Water Removal

Modified Atmosphere Packaging (MAP)

Aroma and Odour Removal

Regulations

Market Scenario

22. Nanotechnology in Food Packaging

Nanomaterials in Food Packaging

Nanocomposites

Silver Nanoparticles and Nanocomposites as

Antimicrobial Food Packaging Materials

Nanosensors

Oxygen Sensors

Stress and Temperature Sensors

Biosensors

Advantages Nanotechnology to Food Packaging

Market Scenario

23. BIS Specifications

24. Sample Plant Layouts

25. Photographs of Machinery with Supplier's Contact Details

NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas,

Business Ideas for Entrepreneurs, Market Research, Manufacturing Process, Machinery, Raw Materials, Project Feasibility, Investment Opportunities, Technical Consultancy and Startup Help.

NPCS also publishes process technology books, technical books, startup books, directory, business database, detailed project reports and market research reports.

Our Detailed Project Report aims at providing all the critical data required by entrepreneurs for starting new business ventures.

NIIR PROJECT CONSULTANCY SERVICES

106-E, Kamla Nagar, New Delhi-110007, India

Email: npcs.india@gmail.com **Website:** <https://www.niir.org/>